Peri-implantitis prevalence and treatment in implant-oriented private practices: A cross-sectional postal and Internet survey

Schmidlin, Patrick R ; Sahrmann, Philipp ; Ramel, Christian ; Imfeld, Thomas ; Müller, Jakob ; Roos, Malgorzata ; Jung, Ronald E

Abstract: Summary This survey aimed to estimate the subjective prevalence of peri-implantitis and its management in the private with and without board certified specialization. For this purpose, a cross-sectional postal and internet survey of 521 dentists, representing all members of the Swiss Society of Oral Implantology (SGI) was conducted (year 2010). The questionnaire consisted of four sections assessing 1) general information regarding the practice setting and education, 2) general questions regarding implantation profile and 3) specific questions regarding the prevalence and experience with the management of peri-implantitis. In the fourth section, therapy options of three exemplary cases were assessed. The data were separately evaluated and compared for specialists (S) and n specialists (N-S). A total of 253 questionnaires could be included in the present study. The results revealed that specialists placed significantly more implants than non-specialists. The subjective prevalence of cases with peri implantitis was 5-6 and 7-9% after 5 and 10 years, respectively. The polled dentists perceived periodontitis (N-S: 72%; S: 80%), smoking (N-S: 71; S: 77%) and bad compliance (S: 53; N-S: 61%) as the most important risk factors for peri-implantitis. Chlorhexidine was the most frequently used antiseptic agent for disinfection. A surgical approach to treat peri-implantitis was reported by more than 80% of all dentists. Specialists used significantly more resective or regenerative approaches than non-specialists.

Originally published at:
Schmidlin, Patrick R; Sahrmann, Philipp; Ramel, Christian; Imfeld, Thomas; Müller, Jakob; Roos, Malgorzata; Jung, Ronald E (2012). Peri-implantitis prevalence and treatment in implant-oriented private practices: A cross-sectional postal and Internet survey. Schweizer Monatsschrift für Zahnmedizin, 122(12):1136-1144.

Peri-implantitis prevalence and treatment in implant-oriented private practices: A cross-sectional postal and internet survey

Patrick R. Schmidlin[1], Philipp Sahrmann[1], Christian Ramel[2], Thomas Imfeld[1], Jakob Müller[1], Malgorzata Roos[3], Ronald E. Jung[2]

[1] Clinic for Preventive Dentistry, Periodontology and Cariology, Centre for Dental and Oral Medicine and Maxillofacial Surgery, University of Zurich, Switzerland

[2] Clinic of Fixed and Removable Prosthodontics and Dental Material Science, Centre for Dental Medicine, University of Zurich, Switzerland

[3] Division of Biostatistics, ISPM, University of Zurich, Hirschengraben 84, 8001 Zurich, Switzerland

Running title: Peri-implantitis survey

Keywords: Peri-implantitis; Mucositis; GBR; survey

Correspondence address: PD Dr. Patrick R. Schmidlin, Plattenstrasse 11, 8032 Zürich, Switzerland, Tel.: +41 44 634 08 46, Fax: +41 44 634 43 08, e-mail: patrick.schmidlin@zzmk.uzh.ch

Peri-implantitis prevalence and treatment in implant-oriented private practices: A cross-sectional postal and internet survey

Abstract

This survey aimed to estimate the subjective prevalence of peri-implantitis and its management in the private practice of dentists with and without board certified specialization. For this purpose, a cross-sectional postal and internet survey of 521 dentists, representing all members of the Swiss Society of Oral Implantology (SGI) was conducted (year 2010). The questionnaire consisted of four sections assessing 1) general information regarding the practice setting and education, 2) general questions regarding implantation profile and 3) specific questions regarding the prevalence and experience with the management of peri-implantitis. In the fourth section, therapy options of three exemplary cases were assessed. The data were separately evaluated and compared for specialists (S) and non-specialists (N-S).

A total of 253 questionnaires could be included in the present study. The results revealed that specialists placed significantly more implants than non-specialists. The subjective prevalence of cases with peri-implantitis was 5-6 and 7-9% after 5 and 10 years, respectively. The polled dentists perceived periodontitis (N-S:72%; S:80%), smoking (N-S:71; S:77%) and bad compliance (S:53; N-S:61%) as the most important risk factors for peri-implantitis. Chlorhexidine was the most frequently used antiseptic agent for disinfection. A surgical approach to treat peri-implantitis was reported by more than 80% of all dentists. Specialists used significantly more resective or regenerative approaches than non-specialists.

Zusammenfassung

Mit der vorliegenden Befragung unter Schweizer Zahnärzten sollte untersucht werden, wie häufig Peri-implantitis in spezialisierten und nichtspezialisierten Zahnarztpraxen subjektiv diagnostiziert und behandelt wird. Im Zuge dieser Querschnittsstudie wurde im Jahre 2010 ein Fragebogen in deutsch und französisch als Brief oder Email an 521 Mitglieder der Schweizerischen Gesellschaft für Implantologie (SGI) gesendet. Der Fragebogen war in vier Abschnitte gegliedert: Im ersten Abschnitt wurden allgemeine Daten zu Praxis und Aus- und Weiterbildung der Zahnärzte erfragt. Der zweite Teil enthielt Fragen zu Art und Häufigkeit der durchgeführten Implantationen. Im 3. Abschnitt wurden spezifische Fragen zur subjektiven Prävalenz der Periimplantitis und den Erfahrung bei den entsprechenden Behandlungsergebnissen gestellt. Im vierten Abschnitt wurden die Zahnmediziner nach Therapieoptionen für drei Beispielfälle gefragt. Die Datenauswertung erfolgte separat für Spezialisten (S) und „Nichtspezialisten“ (NS).

Insgesamt fanden 253 beantwortete Fragebögen Einzug in die Studie. Spezialisten und Nich-Spezialisten praktizierten im Schnitt seit 23- respektive 25 Jahren und verfügten über eine im Mittel 17-jährige implantologische Behandlungserfahrung. Spezialisten implantierten signifikant häufiger als Nichtspezialisten, wobei für beide Gruppen gesicherte Risikofaktoren wie parodontale Resttaschen und Rauchen nur eine relative Kontraindikation für eine Implantation darstellten. Dentalhygienikerinnen waren in 95% bzw. 88% der Praxen beschäftigt und in jeder zweiten Praxis war ferner eine Prophylaxeassistentin angestellt. Die Häufigkeit subjektiv diagnostizierter Periimplantitisfälle bewegte sich zwischen 5-6% (S) bzw. 7-9% (NS) nach 5 respektive 10 Jahre nach Implantation. Als wichtigste Risikofaktoren für die Periimplantitis nannten die Befragten Parodontitis (80% S, 72% NS), Rauchen (77% S, 71% NS) und schlechte Mitarbeit des Patienten. Bezüglich der Therapie der Periimplantitis ergab sich, dass diese von 80% der Zahnärzte mittels chirurgischer Techniken behandelt wurde, wobei Spezialisten signifikant häufiger einen resektiven oder regenerativen

Therapieansatz wählten. Dabei fand die Kombination aus xenogenen Füllern und Membranen am Häufigsten Verwendung. Bezüglich der anti-inflammatorischen Therapie wurde Chlorhexidin als das am Häufigsten eingesetzte Antiseptikum genannt, wobei von den Spezialisten signifikant häufiger (83% S, 66% NS) Antibiotika systemisch verabreicht wurden.

Zusammenfassend lässt sich sagen, dass bei den befragten implantatorientierten Praxen zumeist Dentalhygienikerinnen beschäftigt waren und die berichtete Prävalenz für Periimplantitis mit 7-9% 10 Jahre nach Implantation subjektiv als eher gering empfunden wurde.

Introduction

The insertion of dental implants has become a routine procedure to replace one or more missing teeth. With the implant survival as the main criterion for success, the majority of clinical studies showed impressive success rates for dental implants, even in combination with cantilever extensions (BLANES et al. 2007, AGLIETTA et al. 2009). However, there is evidence of chronic inflammation of peri-implant soft and hard tissues in the range of 8.6% - 9.7% (PJETURSSON et al. 2004, JUNG ET AL. 2008) after five years and peri-implantitis is a frequent clinical finding ten years after implantation (ROOS-JANSAKER et al. 2006). The pathologic conditions termed "mucositis" and "peri-implantitis" are considered the major complication in today´s dental implantology (JUNG et al. 2008). The clinical manifestations of peri-implantitis are gingival bleeding and/or pus secretion, swelling and bone loss which highly resemble periodontal inflammation. A number of studies showed a bacterial etiology with a similar spectrum of pathogens for both diseases (MOMBELLI 1993, PONTORIERO et al. 1994, MEFFERT 1996). It is therefore not surprising that, after 10 years, implants in periodontally compromised patients yield lower survival rates and higher mean marginal bone loss rates when compared with implants placed in healthy subjects (MATARASSO et al. 2010). However, this issue remains controversial, because studies also found that a previous history of periodontal disease may not have a significant impact on implant failures up to 5 years after loading (GIANSERRA et al. 2010).

Due to the background and evidence of potential biological risks, a broad variety of different treatment modalities have been proposed for the prevention and treatment of this disease entity and several mechanical, physical and chemical approaches were suggested to fight peri-implantitis in non-surgical as well as in surgical treatment concepts based on current periodontal therapy (SCHWARZ et al. 2005; ESPOSITO et al. 2008). However, neither laboratory nor clinical investigations were able to elaborate consensus and evidence supporting

predictable and stable healing by a specific treatment protocol, especially in regenerative approaches (SAHRMANN et al. 2009).

Lambrecht and co-workers published a cross-sectional survey on the status of implantology in Switzerland in 2006. Compared to a study undertaken 12 years ago, the number of dentists engaged in implantology has doubled and an increasing willingness of implantologists to extend the therapeutic range of implant dentistry with the risk of potential complications was reported (LAMBRECHT et al. 2010). Nevertheless, long-term prognosis was still a crucial factor when planning and placing implants.

No data on the prevalence and management of biological complications, i.e. mucositis/peri-implantitis in private practice are available to date. Therefore, the purpose of this study was to evaluate the subjectively estimated prevalence of peri-implantitis and its management in the private practice of dentist with and without board certified specializations.

Materials and Methods

Study design and participants

A cross-sectional postal and internet survey of 521 dentists practising in Switzerland was conducted. The sample included all members of the Swiss Society of Oral Implantology. Four-hundred-and-twenty-nine structured questionnaires in German and 92 in French language were dispatched in winter 2009/2010. There was also an opportunity to fill out the questionnaire in electronic form. All questionnaires returned within three months were included in the analysis.

Questionnaire

The questionnaire consisted of four sections (Tables 1-4).

Most of the questions had multiple choices of answers. The first section addressed the profile of the dentist and the practice, more specifically the dentist's age, number of years since

graduation, working area (urban versus rural area), speciality (periodontics, prosthodontics, maxillofacial and/or oral surgery or other) and the employment of dental hygienists or prophylaxis assistants. The second section asked about the implant systems used, the number of implants placed per year, the main contraindications and clinical limitations (e.g. smoking and periodontitis), immediate implant placement, augmentation techniques and materials used in primary surgery and for the retention of the suprastructure, i.e. cementation or screw-retention of single crowns or bridges. The third section consisted of questions regarding the occurrence and the management of peri-implantitis, e.g. the subjective prevalence of peri-implantitis cases in the office and the preferred treatment options: e.g. mechanical instruments, use of antiseptics and antibiotics, GBR techniques as well as observed potential risk factors believed to be associated with peri-implantitis. In the fourth section three clinical cases were presented: Three radiographs of osseo-integrated implants with moderate to severe bone loss were shown (Figures 1-3). The dentists were asked to indicate their treatment choice among the following treatment options: Supragingival cleaning and oral hygiene reinstruction and motivation, non-surgical mechanical therapy or surgical intervention with and without regenerative techniques. The latter modalities could be chosen with or without systemic antibiotics. The final option was explantation.

Statistical analysis

Data were coded in Excel and analysed in PASW Version 18.0. Descriptive statistics such as mean and standard deviation for continuous variables and relative frequencies for discrete variables separately for specialists and non-specialists were computed. Dentists were rated as specialists, if it was clearly stated that they were board certified by one of the following organizations officially approved by the Swiss Dental Association SSO: Periodontology (Swiss Society of Periodontology), Reconstructive Dentistry (Swiss Society of Reconstructive Dentistry) and Oral Surgery (Swiss Society of Oral Surgery).

In order to investigate differences in means of continuous variables between specialists and non-specialists a two-sample Student's t-test was computed. In order to find an association between two discrete variables Chi2-test (r x c) and the Fisher's exact test (2x2 contigency tables) were applied. The Chi2-test was applied in order to find the association between a specialist and a non-specialist (r = 2) and location or implants per year (c > 2) as they are factors which exhibit more than two levels.

In order to find out which features are common to specialists a multiple regression model was used. First, we evaluated the features that were significant or showed a tendency ($p<0.1$) in the univariate analyses using a univariate logistic regression. The best multiple model has been found by applying the forward and backward model choice techniques for binary regression provided by PASW. For the final multiple model we calculated the adjusted odds ratios (OR) with the corresponding 95% confidence intervals (CI) and conducted a receiver operating characteristic analysis (ROC). Area under the curve (AUC) estimates the chance of correct distinction between the specialist-group and the non-specialist-group given the predictors in the model.

Results of the statistical analysis with p-value ≤ 0.05 were interpreted as statistically significant.

Results

A total of 429 German and 92 French questionnaires were sent to all members of Swiss Society of Implantology. Two-hundred-and-fifty-three questionnaires were completed (response rate 49%).

The results of the survey are presented in Tables 1 to 3. Multiple answers were possible.

Table 1 shows the dentist profiles of specialists (n=81) and non-specialists (n=172). The mean age of both groups was comparable with 49.8±9.4 versus 51.6±9.2 years. The mean professional experience was somewhat more than 20 years for both groups, as was the mean

experience in implant therapy with 17 years. Specialists received more referrals for implant insertion than non-certified dentists ($p \leq 0.05$). There was a tendency for specialists to have their practice in a more urban environment. The collaboration with dental hygienists in the practice is well established in Switzerland as about 90% of the dentists reported to employ a professional in this field. About 50% also reported to employ in their team a prophylaxis assistant working exclusively in the supragingival area.

Table 2 depicts the implant profile of the polled dentists.

The most frequently used implant system among the participants of this survey was that of Straumann (almost 70%), followed by Biomet 3i and Thommen Medical implant systems (around 20%, each).

Specialists placed significantly more implants than non-specialists: About 50% of the specialists reported to perform more than 100 implantations per year, whereas more than 50% of the non-specialists placed less than 50 implants in the same time period. Twenty-five to 30% of the respondents placed “up to 100 implants” per year in both groups.

Primary indication for implants was the replacement of single missing teeth (around 50% in both groups). Fixed bridges and removable prostheses were equally distributed (around 25% each). Immediate implants were placed by around 30% of the dentists. The fixation type, i.e. screw-retained versus cemented, was almost equally distributed.

Upon the question, whether implants are also placed in periodontally compromised patients with residual bleeding pockets of ≥ 5 mm, 41.8% of the non-specialists and 51.9% of the specialists reported to do so ($p > 0.05$). More than 75% of the dentists also reported to place implants in smokers (up to 20 cigarettes).

Table 3 reports on the experience and management of peri-implantitis, which was defined by the presence of bone loss, increased probing pocket depth and bleeding upon probing and/or suppuration. The subjectively self-estimated prevalence of cases was around 5-6 and 7-9% after 5 and 10 years, respectively, in both groups. There was a wide range of the number of

cases, probably depending on the great variations of implants placed in the individual practice settin

gs. Most reported possible etiological factors for peri-implantitis were periodontitis (N-S:72% and S:80%), smoking (N-S:71% and S:77%) and bad compliance (S:53% and N-S:61%). Potential risk factors related to implant form and surface or surgical techniques or methods (augmentation, immediate placements) were also mentioned and varied between 6 to 32%.

The knowledge about the Cumulative Interceptive Supportive Therapy (CIST) (LANG et al. 2000) as a published guideline for peri-implantitis was more frequent in specialists than non-specialists ($p < 0.001$). Debridement of contaminated implants was mainly performed by mechanical means using conventional or modified hand and ultrasonic instruments and tips in both groups. Other modern methods reported for surface decontamination were hard lasers (S:22% and N-S: 29%), air-abrasion (S:22% and N-S:12%) or photodynamic therapy (S:21% and N-S: 15%). Chlorhexidine was the most frequently used antiseptic agent for disinfection (S:94% and N-S: 87%). Specialists were using systemic antibiotics more frequently than non-specialists (83% and 66%, respectively, $p = 0.005$). About 50% stated applying locally administered antibiotics. Less than one third of the dentists performed microbiological testing before antibiotic use.

Surgical techniques to treat peri-implantitis were reported by more than 80% of the dentists in both groups. Resective or regenerative approaches were more frequently applied by specialists than non-specialists (68 vs. 47% and 79 vs. 56%, respectively). Classical GBR techniques using filler materials and membranes were reported. Almost one fifth of the specialists reported to use solely enamel matrix derivatives (EMD) to regenerate peri-implantitis defects. A combination of filler material, EMD and membrane was used by 22.5% of the specialists as compared to 9% of the non-specialists ($p = 0.004$). Xenogenic materials were the most frequently applied filler and membrane materials, but were more frequently applied by specialists than non-specialists ($p = 0.005$ and 0.001, respectively).

In summary, multiple logistic regression analysis (AUC=0.762, p<0.001, 95%CI (0.698,0.827)) revealed that the specialists used more frequently the Thommen Medical implants (SPI) (OR=2.5 with 95%CI (1.1, 5.6)), inserted more than 100 implants in one year (OR=3 with 95%CI (1.5,5.7)), used more frequently systemic antibiotics (OR=3 with 95%CI (1.4,6.3)) and conducted more resective and regenerative surgical techniques than non-specialists (OR=2.4 with 95%CI (1.3,4.5) and OR=2.2 with 95%CI (1.1,4.4), respectively).

With regard to the presented cases, specialists and non-specialists had, with some variations, the same treatment strategies. In case one (Table 4), non-surgical therapy was considered by only 3% of the non-specialists and 5% of the specialists. The two most favoured therapeutic options were completely antithetic. About one third chose a regenerative approach with systemic antibiotics whereas another third preferred an explantation of the affected implant.

As to the second clinical example (Table 5), almost 50% of the respondents proposed to treat the implant with a regenerative approach with systemic antibiotics, while 18 to 26% favoured a surgical intervention in combination with antibiotics. Explantation and resective therapy were chosen by a minority of the respondents only (less that 10%).

In the third case (Table 6), almost 50% of the respondents considered it irrational to treat the implant and advocated explantation. Thirteen to 18% aimed to do a resective approach and about 10% selected a watchful waiting approach with non-surgical therapy.

Discussion

This cross-sectional postal and internet survey aimed to evaluate the experience and practice of peri-implantitis cases among active members of the Swiss Society of Implantology (SGI). The overall response rate was 49%, despite the fact that no reminder was sent. Thus, the rate of response was equal or higher than in other recent Swiss surveys, which used a reminder. Lambrecht and co-workers had a response rate of 47.3% in their survey on the status of implantology in Switzerland in 2006, which was sent to all SSO (Swiss Dental Association)

members (LAMBRECHT et al. 2010). A survey among active members of the Swiss Society of Periodontology aiming to collect data concerning the use of enamel matrix derivatives showed return rate of 42.9% (SCHROEN et al. 2011). Kolesaric and co-workers assessed the state of knowledge on squamous cell carcinoma after mailing or handing out 800 questionnaires to Swiss dentists with a final response rate of 22% (KOLESARIC et al. 2007).

The subjective prevalence of peri-implantitis after ten years was 7.3 ± 7.3 % among specialists and 8.9 ±10.6 % among non-specialists. This is less than reported in an investigation by Fransson et al., who found signs of progressive bone loss in 12.4 % of 3413 examined machined Branemark implants after a mean observation period of nine years. Simonis and co-workers, who followed-up 162 Straumann implants for 10-16 years reported an occurrence of peri-implantitis in 16.95% of the cases (SIMONIS et al. 2010) and a review by Zitzmann and Berglundh concluded that peri-implantitis occurred in 12 to 43% of the implant sites (ZITZMANN & BERGLUNDH 2008). Therefore, the subjective estimation of the participants of the present study was slightly lower than published values. However, there is still a lack of conclusive data.

Potential risk factors for peri-implantitis as perceived by the dentists in this survey were periodontitis (N-S:72% and S:80%), smoking (N-S:71& and S:77%) and bad compliance (S:53 and N-S:61%). A recently published study on 374 implants of various manufacturers with a mean follow-up of 8.4 years, clearly identified periodontitis as a risk factor for peri-implantitis (KOLDSLAND et al. 2011). In another study, an odds ratio for peri-implantitis in patients with a history of periodontitis of 5.1 was reported (SIMONIS et al. 2010). This is in accordance with other studies and a recent systematic review, which concluded that subjects suffering from periodontitis were at significantly higher risk for implant failure and marginal bone loss (GATTI et al. 2008, SAFII et al. 2010). However, there are also contradicting findings regarding this topic (GIANSERRA et al. 2010). A review by Schou and co-workers showed that the survival of implants and their suprastructures was not significantly different in individuals

with periodontitis-associated and non-periodontitis-associated tooth loss. However, significantly increased incidence of peri-implantitis and significantly increased peri-implant marginal bone loss were revealed in individuals with periodontitis-associated tooth loss (SCHOU et al. 2006).

Smoking seems to be another risk factor for peri-implantitis (CAVALCANTI et al. 2011). A meta-analysis of 29 publications by Strietzel and co-workers identified smoking as a significant risk factor for implant failure with an odd's ratio of 2.25 (STRIETZEL et al. 2007), which is in accordance with another systematic review also indicating significantly enhanced risks of biologic complications among smokers (HEITZ-MAYFIELD & HUYNH-BA 2009). A lion's share of the scientific literature indicates smoking and a history of periodontitis as clear risk factors for peri-implantitis, which correlates with the opinion of the majority of the present survey's participants. It therefore came as big surprise that upon the question of the present survey, whether implants were also placed in periodontally compromised patients with residual bleeding pockets of ≥ 5 mm, 41.8% of the non-specialists and 51.9% of the specialists reported to do so ($p > 0.05$). Furthermore, over 75% of the polled dentists also reported to place implants in smokers (up to 20 cigarettes) on a regular basis. Broad evidence demonstrating an increased risk for peri-implantitis in patients with a history of periodontal disease, smoking and – very importantly –poor oral hygiene with an odds ratio of up to 14.3 for peri-implantitis (HEITZ-MAYFIELD 2008, LINDHE & MEYLE 2008) did obviously not impress the polled dentists.

Regarding the effective therapy of peri-implantitis no consensus has been reached so far. Non-surgical therapy could be effective in the treatment of peri-implant mucositis, but in peri-implantitis lesions, non-surgical therapy was not found to be effective so far (RENVERT et al. 2008). In contrast, a review by Esposito and co-workers showed that after 4 months, adjunctive local antibiotics to manual debridement in patients who lost at least 50% of peri-implant bone showed improved PAL and PPD (0.6 mm). Nevertheless, it is understandable

that the respondents in the present survey did not rely on non-surgical approaches when being faced with advanced bone loss and lesions not restricted to mucositis. New techniques like hard laser applications and air-abrasion have entered this field to potentially improve the efficacy of non-surgical therapy (RENVERT et al. 2011). A Cochrane review has shown that four out of ten trials, subgingival mechanical debridement alone seemed to achieve results similar to more complex therapies (ESPOSITO et al. 2008). As a conclusion it was stated that there is very little reliable evidence suggesting which could be the most effective interventions for peri-implantitis to date. However, about one fifth of the respondents stated to use different techniques. An important and critical point is the fact that no single method of surface decontamination (chemical agents, air abrasives or lasers) is absolutely safe in terms of perfect decontamination protocols (CLAFFEY et al. 2008). Application of other microbials might be interesting, but there is still a lack of evidence (SAHRMANN et al. 2010).

The use of regenerative procedures such as bone graft techniques with or without the use of barrier membranes has been reported with various degrees of success (CLAFFEY et al. 2008). A recent systematic review aimed to assess the available literature for regenerative treatment of peri-implantitis using bone graft substitutes and membranes (SAHRMANN et al. 2009). Again, a large heterogeneity concerning disinfection protocols and regenerative materials used was found. As an overall finding, complete fill of the bony defect using GBR seemed not to be predictable with regard to the outcome.

Conclusions

From the present cross-sectional survey it can be concluded that implant oriented Swiss private practitioners reveal a subjective prevalence of cases with peri-implantitis of 5-6% specify the groups and 7-9% specify after 5 and 10 years. The polled dentists considered periodontitis (72-80%), smoking (71-77%) and bad compliance (53-61%) as the most important risk factors for peri-implantitis. In terms of treatment, chlorhexidine was the most

frequently used antiseptic agent for disinfection and surgical techniques to treat peri-implantitis were reported by more than 80% of all dentists. Resective or regenerative approaches were more frequently applied by specialists than by non-specialists. Despite a relatively low subjective prevalence of peri-implantitis in private practices in Switzerland, there is an urgent need for safe and predictable treatment modalities and protocols to master future problems in this field and a great need for research and technical improvements is needed.

Acknowledgement:

The authors would like to thank the dentists who made this study possible by answering our questionnaire. The help offered us by the Swiss Society of Implantology in providing us with the relevant addresses and supporting our idea was greatly appreciated.

Tables

Table 1. Dentist profile and practice setting (mean values ± standard deviations where appropriate).

	Specialist n=81	**Significance**	**Non-Specialist n=172**
Age (years)	49.8 ± 9.4	0.151	51.6 ± 9.2
Gender (male, %)	92.6	0.812	90.6
Professional experience (years)	23.1 ± 9.6	0.103	25.2 ± 9.2
Implantation experience (years)	17.3 ± 7.2	0.878	17.1 ± 7.0
Practice for implant **referrals** (%)	48.1	0.007	30.8
Location of the office (%)		(global 0.215)	
- Countryside	12.3	0.882	11.7
- Agglomeration	18.5	0.046	30.4
- City	71.6	0.054	59.1
Occupation (%) of			
- Dental hygienist	95.0	0.090	88.2
- Prophylaxis assistant	52.6	0.325	45.8

Table 2. Implantation profile (mean values ± standard deviations where appropriate).

	Specialist n=81	Significance	Non-Specialist n=172
Implant types used (%)			
- Astra Tech	11.1	0.056	4.7
- NobelBiocare	16.0	0.943	15.7
- Thommen Medical	22.2	0.055	12.8
- Biomet 3i	23.5	0.369	18.6
- Straumann	69.1	0.698	71.5
Implants/year (%):		(global <0.001)	
- ≤ 10	2.5	0.837	2.9
- up to 50	23.8	<0.001	52.0
- up to 100	25.9	0.409	31.0
- up to 200	24.7	0.002	9.9
- ≥ 200	23.5	<0.001	4.1
Tooth replacement type (%)			
- fixed single-crown	51.4 ± 16.0	0.309	53.9 ± 18.2
- fixed bridge	26.2 ± 12.2	0.344	24.6 ± 12.3
- removable	22.2 ± 13.4	0.629	21.3 ± 13.5
Immediate implants (%)	27.5	0.531	31.4
Fixation type (%)			
- Single-crowns			
cemented	60.0	0.190	68.4
screw-retained	52.5 how is possible to have 112.%	0.103	41.5
- Bridges			
cemented		0.126	54.1
screw-retained	43.8	0.108	55.6
	66.3		
Implantation in the case of (%)			
- residual periodontal problems	51.9	0.133	41.8
- Smoking	78.8	0.056	88.4

Table 3. Experience and management of peri-implantitis (mean values ± standard deviations where appropriate).

	Specialist n=81	Significance	Non-Specialist n=172
Peri-implantitis experience			
- within 5 years			
Percentage	5.1 ± 5.9	0.435	6.0 ± 8.0
Numbers	14.7 ± 32.3	0.192	4.8 ± 7.0
- within 10 years			
Percentage	7.3 ± 7.3	0.261	8.9 ± 10.6
Numbers	18.8 ± 46.8	0.167	4.5 ± 4.6
Suggested reasons for peri-implantitis (%)			
- Periodontitis	79.7	0.194	72.0
- Smoking	76.9	0.365	71.4
- Bad compliance	53.2	0.247	60.9
- Parafunction	20.3	0.618	23.1
- Smooth implant surface	24.4	0.126	16.2
- Rough implant surface	31.6	0.914	32.3
- Short implants	17.7	0.012	7.1
- Reduced diameter	16.5	0.008	6.0
- After Sinuslift	10.1	0.999	10.1
- After Augmentation	21.5	0.799	20.1
- After immediate loading	31.6	0.671	29.0
Knowledge of **CIST** (%)	61.5	0.001	39.8
Debridement modality (%)			
- Conventional (hand instruments/ultrasonic)	55.6	0.862	54.4
- Special implant inserts	75.3	0.452	70.8
- Air abrasion	22.2	0.029	11.7
- Laser	22.2	0.280	28.7
- Photodynamic therapy	21.0	0.254	15.2
Antimicrobial therapy (%)			
- Systemic antibiotics	82.7	0.005	65.5
- local antibiotics	47.5	0.984	47.4
- Chlorhexidine	93.8	0.106	86.9
- Iodine	19.7	0.182	12.7
Table 3, continued			
Use of a bacterial test (%)	31.6	0.222	24.2
Surgical techniques (%)			
- Open flap debridement	86.3	0.394	81.9
- Resective	68.4	0.002	47.0
- Regenerative	78.8	0.001	56.0
Regenerative approach (%)			
- Filler only	11.3	0.214	6.6
- Filler & membrane	57.5	0.058	44.6
- EMD	18.8	0.205	12.7
- EMD & filler	12.5	0.810	11.4
- EMD & filler & membrane	22.5	0.004	9.0
Regenerative materials (%)			
- Filler material			

alloplastic	21.3	0.633	18.7
xenogenic	75.0	0.005	56.4
autogenous	25.0	0.166	17.5
- Membrane			
alloplastic	7.5	0.802	8.4
xenogenic	76.3	0.001	54.8

Table 4. Therapy options and decisions of case 1 (Percentages)

	Specialist n=81	Significance	Non-Specialist n=172	Rank
Non-surgical therapy	5.1	0.474	3.0	5
- with antibiotics (AB)	1.3	0.999	2.4	
- without systemic AB	2.5	0.242	0.6	
Access Flap	11.4	0.197	18.1	4
- with AB	8.9	0.305	13.8	
- without systemic AB	2.5	0.999	2.4	
Resective Surgery and implant plastic	19.0	0.999	19.2	3
- with AB	12.7	0.700	15.6	
- without systemic AB	2.5	0.596	1.2	
Regenerative therapy	32.9	0.481	37.7	1
- with AB	31.6	0.656	28.7	
- without systemic AB	0	0.100	4.2	
Explantation	30.4	0.882	29.3	2

Table 5. Therapy options and decisions of case 2 (Percentages)

	Specialist n=81	Significance	Non-Specialist n=172	Rank
Non-surgical therapy	17.7	0.580	15.0	3
- with AB	10.3	0.316	6.6	
- without systemic AB	6.3	0.761	4.8	
Access Flap	17.7	0.196	25.9	2
- with AB	15.2	0.717	18.0	
- without systemic AB	3.8	0.999	4.2	
Resective Surgery and implant plastic	6.4	0.473	9.6	4
- with AB	2.5	0.237	7.2	
- without systemic AB	0	0.181	3.6	
Regenerative therapy	46.8	0.682	50.3	1
- with AB	39.2	0.678	42.8	
- without systemic AB	3.8	0.099	0.6	
Explantation	7.6	0.594	6.0	4

Table 6. Therapy options and decisions of case 3 (Percentages)

	Specialist n=81	Significance	Non-Specialist n=172	Rank
Non-surgical therapy	11.4	0.825	10.2	3
- with AB	1.3	0.999	2.4	
- without systemic AB	7.6	0.791	6.6	
Access Flap	8.9	0.619	7.2	4
- with AB	2.5	0.999	2.4	
- without systemic AB	5.1	0.999	5.4	
Resective Surgery and implant plastic	17.7	0.440	13.3	2
- with AB	8.9	0.999	9.0	
- without systemic AB	5.1	0.216	1.8	
Regenerative therapy	2.5	0.510	5.4	5
- with AB	2.5	0.510	5.4	
- without systemic AB	0	0.309	2.4	
Explantation	46.8	0.999	47.2	1

Figure 1

Case 1: Exemplary X-ray of an implant affected by severe peri-implantitis. The residual dentition is without any pathological findings, i.e. no present caries and periodontal involvement. Probing depths are only increased and localized around the implant (> 6 mm) and there is bleeding and suppuration. The implant is stable. The patient is systemically healthy, non-smoker and compliant with good oral hygiene.

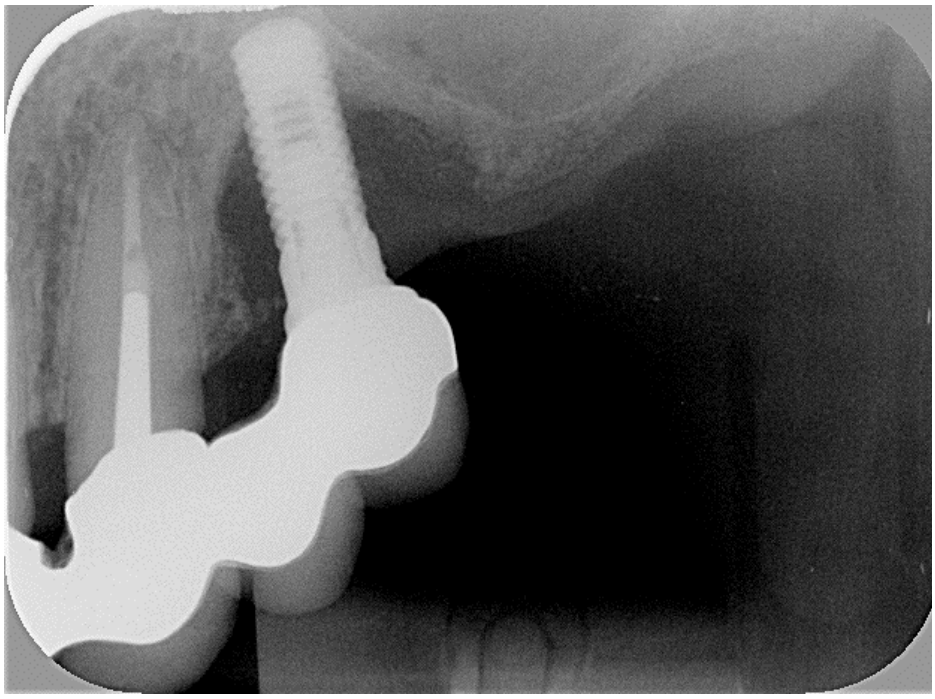


Figure 2

Case 2: Exemplary X-ray of a localized peri-implantitis. The residual dentition and the implants are without any pathological findings, i.e. no caries and periodontal involvement. Probing depths are only increased and localised around the implant (> 6 mm) and there is bleeding and suppuration. The implant is stable. The patient is systemically healthy, non-smoker and compliant with good oral hygiene.

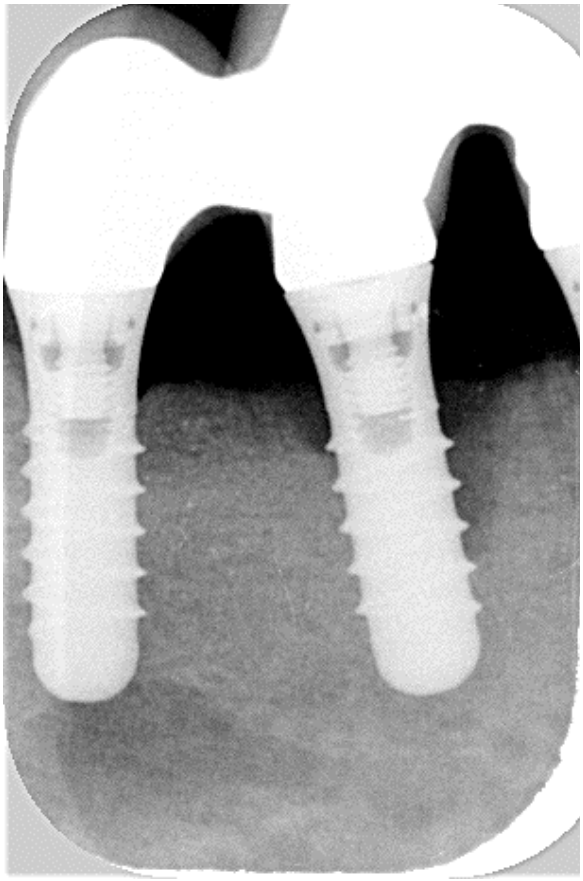
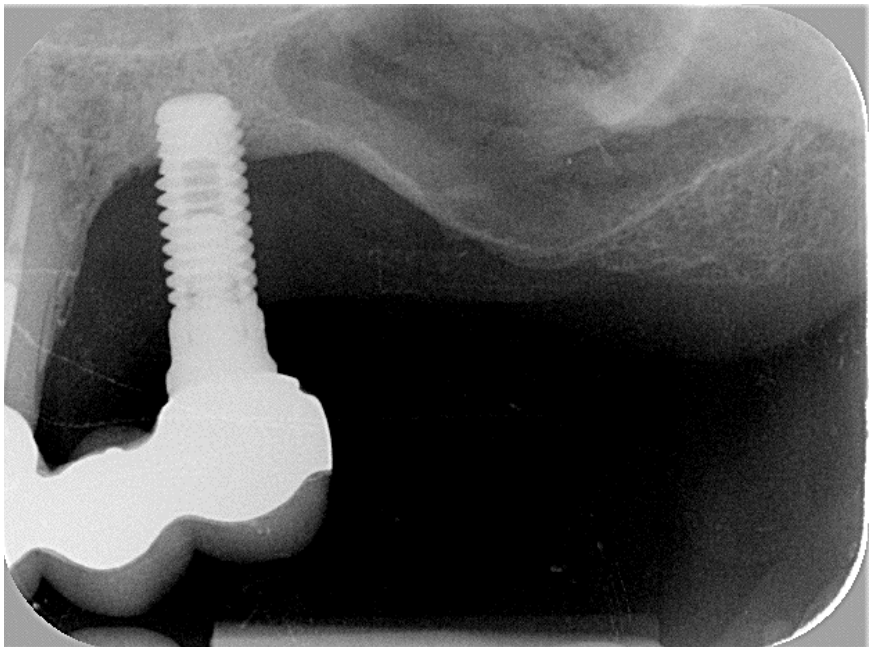


Figure 3

Case 3: Exemplary X-ray of a localized peri-implantitis. The residual dentition is without any pathological findings, i.e. no caries and periodontal involvement. Probing depths are only increased and localised around the implant (> 6 mm) and there is bleeding and suppuration. The implant is stable. The patient is systemically healthy, non-smoker and compliant with good oral hygiene.



References

Aglietta M, Siciliano VI, Zwahlen M, Bragger U, Pjetursson BE, Lang NP, Salvi GE: A systematic review of the survival and complication rates of implant supported fixed dental prostheses with cantilever extensions after an observation period of at least 5 years. Clin Oral Implants Res 20: 441-451 (2009)

Blanes RJ, Bernard JP, Blanes ZM, Belser UC: A 10-year prospective study of ITI dental implants placed in the posterior region. II: Influence of the crown-to-implant ratio and different prosthetic treatment modalities on crestal bone loss. Clin Oral Implants Res 18: 707-714 (2007)

Cavalcanti R, Oreglia F, Manfredonia MF, Gianserra R, Esposito M: The influence of smoking on the survival of dental implants: a 5-year pragmatic multicentre retrospective cohort study of 1727 patients. Eur J Oral Implantol 4: 39-45 (2011)

Claffey N, Clarke E, Polyzois I, Renvert S: Surgical treatment of peri-implantitis. J Clin Periodontol 35: 316-332 (2008)

Esposito M, Grusovin MG, Coulthard P, Worthington HV: The efficacy of interventions to treat peri-implantitis: a Cochrane systematic review of randomised controlled clinical trials. Eur J Oral Implantol 1: 111-125 (2008)

Gatti C, Gatti F, Chiapasco M, Esposito M: Outcome of dental implants in partially edentulous patients with and without a history of periodontitis: a 5-year interim analysis of a cohort study. Eur J Oral Implantol 1: 45-51 (2008)

Gianserra R, Cavalcanti R, Oreglia F, Manfredonia MF, Esposito M: Outcome of dental implants in patients with and without a history of periodontitis: a 5-year pragmatic multicentre retrospective cohort study of 1727 patients. Eur J Oral Implantol 3: 307-314 (2010)

Heitz-Mayfield LJ, Huynh-Ba G: History of treated periodontitis and smoking as risks for implant therapy. Int J Oral Maxillofac Implants 24 Suppl: 39-68 (2009)

Heitz-Mayfield LJ: Peri-implant diseases: diagnosis and risk indicators. J Clin Periodontol 35: 292-304 (2008)

Jung RE, Pjetursson BE, Glauser R, Zembic A, Zwahlen M, Lang NP: A systematic review of the 5-year survival and complication rates of implant-supported single crowns. Clin Oral Implants Res 19: 119-130 (2008)

Kolesaric N, Borner BI, Sader R, Meyer J, Zeilhofer HF: [Early detection and prevention of oral precancer. An enquiry among dentists in Switzerland]. Schweiz Monatsschr Zahnmed 117: 911-919 (2007)

Koldsland OC, Scheie AA, Aass AM: The association between selected risk indicators and severity of peri-implantitis using mixed model analyses. J Clin Periodontol 38: 285-292 (2011)

Lambrecht JT, Cardone E, Kuhl S: Status report on dental implantology in Switzerland in 2006. A cross-sectional survey. Eur J Oral Implantol 3: 71-74 (2010)

Lang NP, Wilson TG, Corbet EF: Biological complications with dental implants: their prevention, diagnosis and treatment. Clin Oral Implants Res 11 Suppl 1: 146-155 (2000)

Lindhe J, Meyle J: Peri-implant diseases: Consensus Report of the Sixth European Workshop on Periodontology. J Clin Periodontol 35: 282-285 (2008)

Matarasso S, Rasperini G, Iorio Siciliano V, Salvi GE, Lang NP, Aglietta M: A 10-year retrospective analysis of radiographic bone-level changes of implants supporting single-unit crowns in periodontally compromised vs. periodontally healthy patients. Clin Oral Implants Res (2010)

Meffert RM: Periodontitis vs. peri-implantitis: the same disease? The same treatment? Crit Rev Oral Biol Med 7: 278-291 (1996)

Mombelli A: Microbiology of the dental implant. Adv Dent Res 7: 202-206 (1993)

Pjetursson BE, Tan K, Lang NP, Bragger U, Egger M, Zwahlen M: A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years. Clin Oral Implants Res 15: 667-676 (2004)

Pontoriero R, Tonelli MP, Carnevale G, Mombelli A, Nyman SR, Lang NP: Experimentally induced peri-implant mucositis. A clinical study in humans. Clin Oral Implants Res 5: 254-259 (1994)

Renvert S, Roos-Jansaker AM, Claffey N: Non-surgical treatment of peri-implant mucositis and peri-implantitis: a literature review. J Clin Periodontol 35: 305-315 (2008)

Renvert S, Lindahl C, Roos Jansaker AM, Persson GR: Treatment of peri-implantitis using an Er:YAG laser or an air-abrasive device: a randomized clinical trial. J Clin Periodontol 38: 65-73 (2011)

Roos-Jansaker AM, Renvert H, Lindahl C, Renvert S: Nine- to fourteen-year follow-up of implant treatment. Part III: factors associated with peri-implant lesions. J Clin Periodontol 33: 296-301 (2006)

Sahrmann P, Puhan MA, Attin T, Schmidlin PR: Systematic review on the effect of rinsing with povidone-iodine during nonsurgical periodontal therapy. J Periodontal Res (2009)

Sahrmann P, Attin T, Schmidlin PR: Regenerative Treatment of Peri-Implantitis Using Bone Substitutes and Membrane: A Systematic Review. Clin Implant Dent Relat Res (2009)

Sahrmann P, Puhan MA, Attin T, Schmidlin PR: Systematic review on the effect of rinsing with povidone-iodine during nonsurgical periodontal therapy. J Periodontal Res 45: 153-164 (2010)

Safii SH, Palmer RM, Wilson RF: Risk of implant failure and marginal bone loss in subjects with a history of periodontitis: a systematic review and meta-analysis. Clin Implant Dent Relat Res 12: 165-174 (2010)

Schou S, Holmstrup P, Worthington HV, Esposito M: Outcome of implant therapy in patients with previous tooth loss due to periodontitis. Clin Oral Implants Res 17 Suppl 2: 104-123 (2006)

Schroen O, Sahrmann P, Roos M, Attin T, Schmidlin PR: A survey on regenerative surgery performed by Swiss specialists in Periodontology with special emphasis on the application of enamel matrix derivatives in infrabony defects. Schweiz Monatsschr Zahnmed 121: 136-142 (2011)

Schwarz F, Sculean A, Romanos G, Herten M, Horn N, Scherbaum W, Becker J: Influence of different treatment approaches on the removal of early plaque biofilms and the viability of SAOS2 osteoblasts grown on titanium implants. Clin Oral Investig 9: 111-117 (2005)

Strietzel FP, Reichart PA, Kale A, Kulkarni M, Wegner B, Kuchler I: Smoking interferes with the prognosis of dental implant treatment: a systematic review and meta-analysis. J Clin Periodontol 34: 523-544 (2007)

Simonis P, Dufour T, Tenenbaum H: Long-term implant survival and success: a 10-16-year follow-up of non-submerged dental implants. Clin Oral Implants Res 21: 772-777 (2010)

Zitzmann NU, Berglundh T: Definition and prevalence of peri-implant diseases. J Clin Periodontol 35: 286-291 (2008)

Résumé (sollte noch kontrolliert und editiert werden !!!)

La présente enquête auprès des dentistes suisses a étudiée, comme la péri-implantite est subjectivement diagnostiqué et traité chez des dentistes spécialisés et non spécialisés. Cette étude menée en 2010 a envoyé un questionnaire en allemand et en français à 521 membres de la Société suisse d'implantologie. Le questionnaire était divisé en quatre sections: Dans la première section, des informations générales sur la pratique et la formation et l'éducation des dentistes était demandé. La deuxième partie contient des questions sur la nature et la fréquence d'implantations réalisées. Dans la troisième Section des questions précises sur la prévalence de la péri-implantite subjective et de l'expérience ont été posées. Dans la quatrième section, les dentistes ont été interrogés sur les options de traitement en montrant trois cas de l'échantillon. L'analyse des réponses a été effectuée séparément pour les spécialistes (S) et «non-spécialistes" (NS).

Un total de 253 questionnaires remplis était inclus. Les dentistes pratiquaient en moyenne 23 - 25 ans dans la profession, et avaient en moyenne 17 ans d'expérience avec le traitement implantaire. Les spécialistes implantaient significativement plus souvent que les non-spécialistes. Pour les deux groupes, les facteurs de risque comme le tabagisme et les poches parodontales représentaient une contre-indication relative à l'implantation.

La fréquence de peri-implantite subjectivement diagnostiqué variait entre 5-6% (S) ou 7-9% (NS) après 5 ou 10 ans après l'implantation. Les principaux facteurs de risque de péri-implantite étaient la parodontite (80% S, 72% NS), le tabagisme (77% S, 71 NS%) et pauvre collaboration. En ce qui concerne le traitement de la péri-implantite a été constaté que la péri-implantite a été traité par 80% des dentistes avec des techniques chirurgicales. Les spécialistes significativement plus souvent opté pour une approche de thérapie résection ou régénératrices. Ici, la combinaison des charges et des membranes xénogéniques a été le plus fréquemment utilisé. En ce qui concerne la thérapie anti-inflammatoire, le chlorhexidine était le plus

souvent utilisé et les spécialistes administraient plus souvent des antibiotiques par voie systémique (83% S, 66%, NS).

En résumé nous pouvons dire que parmi les dentistes interrogés les hygiénistes dentaires ont été employées très souvent et que la prévalence de la péri-implantite déclarée a été vu avec 7-9% dix ans après l'implantation subjective plutôt faible.